
















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DLR Nightly Schedule

DLR airs listener-supported public radio in Bismarck, North Dakota from 5:00 a.m. to 10:30 p.m. You can [Listen Live](#) to streaming audio of our broadcast. Please refer below for our current nightly schedule.

Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun
6:00 PM	National News						
6:30 PM	World News						
7:00 PM	Opera Fest	Radio U	Science Week	The Living World	Word Play	Agri-Week	Folk Fest
7:30 PM					Brain Stew	Bismarck Forum	
8:00 PM	The Classical Music Connection				Old Time Radio	Saturday Nite Jazz	The Indie Connection
8:30 PM					The Inner Mind		
9:00 PM					Open Mike Nite		
9:30 PM							
10:00 PM	World News Feed						

DLR ends its broadcast day at 10:30 p.m.

All Times Central

On the Air Now

Folk Fest

Featuring the best of traditional and modern folk music

Coming Up on DLR

April 11-14 The Classical Music Connection

Peter Thiesen shares his eclectic selection from the world of classical music

April 11 Opera Fest

Excerpts from *Turandot* by Giacomo Puccini

April 12 Radio U

SF author Karen Graves reads selections from her latest work, *Hellion of Troy*

April 13 Science Week

Prof. Thomas Glass from UND discusses *String Theory* and *Spooky Action at a Distance*

April 14 The Living World

Tim Unger explores the economic impact of *driverless cars* and presents the latest in eco-news

dlr_lw0414



The Living World

April 14

Join host Tim Unger for this week's edition of *The Living World* where we discuss the future and economic impact of *autonomous vehicles*, otherwise known as *driverless cars*.

Rise of the Driverless Car and How It Will Impact You

Your world is about to change with widespread adoption of driverless cars. Driverless cars or autonomous vehicles that interact with their surroundings with radar, GPS, proximity sensors, and computer image enhancement. This information is fed into a control system that uses it to plot navigation paths and to respond to obstacles and road directions. A driverless car is capable of updating its status based on changing conditions. Driverless cars should be autonomous even when entering uncharted regions.

In the United States, the National Highway Traffic Safety Administration (NHTSA) has proposed the following levels of autonomy for motorized vehicles:

Level 0 The driver completely controls the vehicle at all times.

Level 1 Individual vehicle controls are automated, such as electronic stability control or automatic braking.

Level 2 At least two controls can be automated in unison, such as adaptive cruise control in combination with lane keeping.

Level 3 The driver can fully cede control of all safety-critical functions in certain conditions. The car senses when conditions require the driver to retake control and provides a "sufficiently comfortable transition time" for the driver to do so.

Level 4 The vehicle performs all safety-critical functions for the entire trip, with the driver not expected to control the vehicle at any time. Because this vehicle would control all functions from start to stop, including all parking functions, it could include unoccupied cars.

Currently, we are at Level 2 with many vehicles able to provide automated safety systems, such as automatic braking in response to input from collision sensors.

When Does Full Autonomy Arrive?

Level 4 autonomous vehicles are arriving and they're arriving quickly. The obstacles to adoption of a driverless economy are legal and technical. The United States traffic code does not prohibit autonomous vehicles, but it also does not specifically address them. Several states, including Nevada, Florida, California, and Michigan, have enacted traffic rules specifically tailored to driverless cars and more states are in the processing of enacting such legislation.

One area of legal entanglement is the laws against distracted driving. Google specifically requested an exemption to permit occupants to send text messages while sitting behind the wheel of an autonomous vehicle. Other similar regulations will need to be addressed as driverless cars move from the testing stage into general use.

Other countries have permitted the testing of autonomous vehicles on public roads. The United Kingdom enacted a testing phase in 2013, followed shortly by France in 2014.

Driverless cars have driven through San Francisco's Lombard Street, navigating its steep hairpin turns, and city traffic. The testing vehicles provide an override to allow a human driver to take control of the car. By August 2012, testers announced that they have driven over 300,000 miles accident-free. By April 2014, autonomous vehicles have logged nearly 700,000 miles. As of June 2015, driverless cars have been involved in 12 minor accidents on public roads. Eight of these accidents involved being rear-ended, two in which the vehicle was side-swiped by another driver, one of which involved another driver rolling through a stop sign, and one where the car was being driven manually.

Driverless cars have not yet been tested in heavy rain or snow due to safety concerns. Nor have they been tested in areas with temporary traffic lights or complex unmapped intersections. The technical issues are daunting. An autonomous vehicle has difficulty with potholes, roadside trash and debris, and interpreting unexpected signals, such as a police car signaling the vehicle to pull over.

Experts predict that autonomous vehicles will gradually be introduced into the market with the following anticipated benchmarks:

2017 U.S. Department of Transportation hopes to publish a rule mandating vehicle-to-vehicle (V2V) communication by an unspecified future date.

2018 Tesla Motors expects to produce a version of fully self-driving cars, where the driver can fall asleep, though the actuality of marketing such a vehicle will depend on the economic and legal climate.

2020 GM, Mercedes-Benz, Audi, Nissan, BMW, Renault, Tesla, and Google all expect to sell vehicles that can drive themselves at least part of the time.

2024 Jaguar expects to release an autonomous car.

2025 Daimler and Ford expect to release autonomous vehicles on the market.

2035 Information Handling Services (IHS) Automotive Report projects that most self-driving vehicles will be operated completely independently from a human occupant's control.

2040 Experts at the Institute of Electrical and Electronics Engineers (IEEE) estimate that up to 75% of all vehicles will be autonomous.

Clearly, the introduction and widespread adoption of autonomous vehicles will have enormous repercussions.

The Impact of Driverless Cars

While it appears at first glance that a driverless car will be more dangerous than a manually driven vehicle, it has been estimated that once we switch to a driverless economy, we will see a 90% reduction in crashes, saving nearly 30,000 lives and preventing 2.12 million injuries annually. Indeed, the whole design of the car will change. Currently, a car is designed around the needs of the driver, but, when all in the car are passengers, the interior space will be designed more economically and efficiently.

Beyond redesigning the car, we will also redesign our system of roads and traffic control. This could mean loss of lots of road signs, lane markers, and street lights. Cars can merge and change lanes more efficiently and speed limits can be safely raised. Traffic control planners can redesign traffic flow to cooperative patterns that will increase safety and reduce travel time (and road rage!)

But this innovation is not without cost. We are a driving-based economy.

Truckers, taxis, car rentals, and car servicing are all based directly or indirectly on manually-driven vehicles. The Bureau of Labor Statistics lists that 884,000 people are employed in motor vehicles and parts manufacturing, and an additional 3.02 million in dealer and maintenance network. Truck, bus, delivery, and taxi drivers account for nearly 6 million professional driving jobs. That is 10 million jobs immediately at risk with a move to a driverless economy and that does not count ancillary industries, such as roadside diners and motels, which will also be affected when we need to drive less often.

On the other hand, research shows that currently manually-driven cars are driven just 4% of the time at an average cost of \$9000 per year in maintenance and upkeep. Thus, an economy in which autonomous vehicles offered through car-sharing services like Uber replace self-owned and self-driven cars, promises an enormous amount of savings to the individual. It is estimated that despite the economic upheaval, eliminating the need for car ownership will yield over \$1 trillion in additional disposable income.

These are exciting times. While the full economic and social impact of a driverless economy are still not fully grasped, the driverless economy once fully implemented will dwarf the impact of the automobile, airplane, personal computer, and cell phone in how it changes our lives and work.

Now we just need to create a driverless car that can fly and I'm all set.